

**Date:** 6 March 2001  
**Time:** 14.00 - 17.30  
**Venue:** Committee Room 1, National Assembly for Wales, Cardiff Bay  
**Title:** Draft report on renewables

**Purpose of paper**

1. To invite the Committee's views on, and amendments to, the attached draft report. In particular Members need to consider the figures to go into Recommendation 2.

**Background**

2. The attached is an expanded version of the draft report discussed at the last meeting of EDC. It takes on board the comments made by Members and includes an executive summary and various annexes giving additional details.

3. Members will particularly wish to consider Recommendation 2 – the target they recommend for the generation of electricity and heat from renewables. The attached includes the figure discussed at the meeting on 13 February and Members will wish to consider this in the light of the information in paper **EDC 05-02(p6): Target for renewables.**

4. The intention is that subject to any amendments this report should be published as a basis for consultation.

**Committee Secretariat**  
**March 2002**

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# Chair's Foreword

## *Photograph*

Industry in Wales requires a secure and competitively priced supply of energy. Businesses need to be able to plan for the future, to make investment in the confident knowledge that energy will be available at a price which justifies the investment. Without this Wales will not be able to compete in the world-wide economy, jobs will never be secure and Wales will not be able to generate the economic growth that we want. In today's modern economy the supply of energy is a complex process. We need to ensure the sustainability of the sources of supply and we also need to ensure that supply is in the right place at the right time.

But the supply of energy is more than this. It is an industrial sector in its own right and one that offers wide-ranging opportunities for a country willing and able to take them. Wales is well endowed with energy resources and has a track record of manufacturing and engineering - both vital to energy production. As a modern economy, we have learned in recent years to embrace new technologies and to work with companies and investors from all over the world. We are therefore well placed to play an active part in the changes necessary to achieve a global shift from reliance on fossil fuels, to combat global warming and develop renewable resources. There are unprecedented opportunities to develop new technologies, for research and innovation, and for Wales to place itself at the forefront of these developments.

In choosing this topic for its next Review, the Economic Development Committee recognised that energy policy is something that involves not just Wales and the UK, but also Europe and the rest of the World. We therefore considered it important to approach the Review from a practical perspective and to look at the specific issues facing Wales. In our first report of the Review we consider the issues arising from the development of renewable energy. We have taken evidence from a range of people and organisations and prepared this report outlining the conclusions we have reached on the basis of this evidence. However, we recognise that there are a wide range of views and interests in Wales and we now invite comments on our deliberations.

The next stage of the Review will address the need to improve energy efficiency. After this we propose to consider Combined Heat and Power and then Economic Drivers. Further reports,

for consultation, will be produced as each of these stages is reached.

The Committee is very grateful to the wide range of people, listed in Annexes C and D, who found the time and effort to prepare papers and to come to meetings to discuss these complex issues. We are also very grateful to the companies who gave us a valuable insight into the opportunities and practical issues related to energy supply by showing us their facilities.

**CHRIS GWYTHYER**  
**Chair**  
**Economic Development Committee**

## **Membership of the Economic Development Committee**

*(including photos)*

|  |   |                   |
|--|---|-------------------|
| Christine Gwyther (Chair)  | Carmarthen West and South Pembrokeshire | Labour            |
| Alun Cairns  | South Wales West                        | Conservative      |
| Christine Chapman  | Cynon Valley                            | Labour            |
| David Davies   | Monmouth                                | Conservative      |
| Ron Davies   | Caerphilly                              | Labour            |
| Mike German  | South East Wales                        | Liberal Democrats |
| Rhodri Morgan<br>(Economic Development Minister until 26 Feb 2002)       | Cardiff West                            | Labour            |
| <b>Andrew Davies</b><br>(Economic Development Minister from 26 Feb 2002) | Swansea West                            | Labour            |
| Alison Halford   | Delyn                                   | Labour            |
| Brian Hancock  | Islwyn                                  | Plaid Cymru       |

Dafydd Wigley

Caernarfon

Plaid Cymru

Phil Williams

South Wales East

Plaid Cymru

## Executive Summary

1. There is a strong scientific consensus that the use of fossil fuels has led to an unprecedented increase in carbon dioxide concentrations in the atmosphere and that this is causing significant climate change. A wide range of studies has pointed to the need to reduce carbon emissions by more than half by about the middle of the century in order to mitigate the extent of climate change. Even so increases of temperature of between 2° C and 5° C are expected with a rise in sea-level of about 0.5m as well as increased precipitation and frequency of storms.

2. Energy policy has to serve all aspects of sustainable development, economic, social and environmental. However, it is clear that for the immediate future environmental concerns must take priority. The necessary reductions in emissions can be achieved by significant increases in energy efficiency, including transport vehicle efficiency, and by reducing the carbon intensity of the fuels used, particularly electricity. Moreover, they can be achieved at the relatively low cost of 0.02% p.a. of GDP.

3. The need to address these changes presents major opportunities for Wales to apply its traditional expertise in the fields of manufacturing and engineering, and to utilise its natural resources, for economic benefit and job creation in both industrial and rural parts of the country. This report focuses on the development of renewable energy as a way to reduce carbon emissions. Later reports will cover energy efficiency and other aspects of policy.

4. Over the next 20 years almost half the power stations in England and Wales will need to be replaced. Wales currently has more than its share of generating capacity, though a smaller proportion of renewable production. Wales has a potentially large renewable energy resource base and there are commercial and rural development opportunities associated with the development of several renewable technologies. Renewable sources have different costs, availability and resource potential. It appears that a mix of on-shore and off-shore wind, biomass, tidal and wave sources will yield the most appropriate medium term contribution to power production. In order to achieve this it is essential that the current barriers to development are addressed, in particular

- a. a streamlining of the planning process
- b. facilitating embedded generation
- c. removing the current penalty applied to intermittent sources of electricity in the wholesale market

d. providing support for the development of local niches and industries.

5. The report makes six broad recommendations. These are:

### **Recommendation 1**

6. We recommend that the National Assembly for Wales:

- a. recognises that over the next twenty to fifty years it will be necessary to move towards a zero carbon electricity system;
- b. seeks to develop its indigenous renewable resources so as to make a timely contribution to the reduction of carbon emissions;
- c. promotes renewable sources of energy in such a way as to enhance industrial, rural and commercial opportunities in Wales without prejudicing tourism or areas of environmental significance.

### **Recommendation 2**

7. We recommend that the National Assembly adopts Welsh targets for both electricity production and heat production from renewable sources. The electricity production targets should be 4 TWh by 2010 rising to 8TWh by 2020. The heat targets should be 1.5 TWh by 2010 and 3 TWh by 2020.

8. In order to promote these targets the National Assembly should seek information from all Local Authorities on the contributions that they consider could be made to meeting such targets from within their areas.

### **Recommendation 3**

9. We recommend that the National Assembly continues to develop its own use of renewable energy with the aim of becoming a 100% user of renewable energy and urges other agencies and public bodies in Wales to foster the development of renewable energy by:

- a. switching to green electricity for their own use;
- b. supporting development projects for technologies that exploit local opportunities or unique resources.

### **Recommendation 4**

10. The National Assembly should add its weight to the pressure to resolve the issues of embedded generation and wholesale market treatment of intermittent sources as a matter of urgency. It should also request clarification from the local Distribution Network Companies on

their policies for connections for renewable generators.

## **Recommendation 5**

11. The National Assembly should;

- a. as a matter of urgency, seek ways to clarify and streamline the planning process for renewable energy developments;
- b. seek an extension of its powers with regard to the approval of power generation facilities;
- c. find mechanisms whereby renewables developments can provide immediate and tangible benefits to the local communities in which they are located.

## **Recommendation 6**

17 We recommend that the Minister for Economic Development identifies the energy sector as a priority sector for development in Wales and ensures there are programmes in place to encourage the development of skills in all parts of the country to meet these needs, and to encourage private sector investment in this vital sector.

## **18. The Report concludes:**

that the National Assembly should seek to promote a vision for renewable energy in Wales that emphasises safe, clean and secure energy supplies and contributes positively to reducing global warming. It should emphasise that this will provide opportunities for industrial and rural development, long-term employment and increased prosperity. Most of all it should promote this vision by example and by vigorously pursuing well thought out policies.

## **1. BACKGROUND TO ENERGY ISSUES IN WALES**

### **The global, international and UK contexts**

#### *Introduction*

1.1 It is essential for a modern industrial society to have a secure and competitively priced supply of energy. This is critical for both its social and economic well being. From an economic perspective, energy is vital for wealth creation and for employment, and is in its own right a

sector that offers a wide range of economic opportunities – research and development, production, exports and offers a wide range of jobs calling for a wide range of skills.

1.2 Over the last two hundred years, the global use of fossil fuels has increased the concentration of carbon dioxide in the atmosphere so much that world climate is changing. To avoid the most adverse effects it is essential that carbon dioxide concentrations are stabilised and this in turn requires significant reductions in carbon emissions. Existing international agreements require countries to reduce emissions of greenhouse gases. The baseline for these is 1990 - under the Kyoto treaty the UK has an obligation to reduce greenhouse emissions by 12.5% by 2010; the government has a manifesto commitment to reduce carbon dioxide emissions by 20% by 2010. Reports from the Intergovernmental Panel on Climate Change (IPCC) suggest larger reductions are required by the middle of this century.

### *Global Warming*

1.3 In his presentation to the Economic Development Committee, Sir John Houghton, Co-chair of the Scientific Assessment Working Group at the IPCC, showed how carbon dioxide levels in the atmosphere has risen from around 280 parts per million (ppm) in the period 1000-1750 to 368 ppm in 2000. The level is now at its highest for millions of years and World scientific opinion attributes this primarily to the burning of fossil fuels. The effect of this is that the average temperature of the Earth's surface is rising at a faster rate than it has for at least 10,000 years and is projected this century to increase by 0.2 to 0.5 ° C per decade. Both humans and ecosystems will find it difficult to adapt to this temperature increase.

1.4 The effect of burning fossil fuels is slow to impact on the environment and even if it were possible to eliminate emissions immediately, adverse effects would continue to increase for the next 50-100 years. The temperature of the earth's surface would continue to rise for a similar period.

1.5 The two most immediate consequences of climate change are a rise in sea levels and a more intense hydrological cycle.

1.6 Assuming a stabilisation of carbon dioxide concentrations at about 550 ppm, the average sea level rise expected by 2100 is around 0.5 m (range of uncertainty 0.1 to 1 m) and the largest contribution to this would come from the expansion of ocean water as it warms. However, in the next 100 years only the top levels of the ocean would warm - it will take much longer for the temperature rise, and consequent expansion, to affect lower levels. Sea level could therefore continue to rise over many centuries. Since over half the world's population lives in coastal regions, many communities will be affected by a rise in sea level. Worst affected will be those in large delta regions, for instance in Bangladesh (around 10 million people live below the one metre contour) and Southern China (perhaps 25 million people affected), and those in low-lying islands in the Indian and Pacific Oceans

1.7 The hydrological cycle is affected because, as the Earth's surface warms, more water will be evaporated and enter the atmosphere. This will result in increased rainfall with more frequent and intense periods of heavy rainfall leading to more frequent and intense flooding in many places. At the same time the air in some drier regions will become drier – leading to more frequent and intense droughts in those regions.

1.8 Sir John Houghton said that to reduce the impact of global warming to between 2° C and 5° C it will be necessary to stabilise carbon dioxide concentrations at about 550 ppm. Even at this level, sea-levels are expected to rise by about 0.5m by the end of the century and it is estimated that by 2050 there would be around 150 million environmental refugees as a consequence.

1.9 The impact of climate change on Wales is the subject of a recent report, "Climate Change Wales – learning to Live Differently". The key impacts are those associated with the rise in sea-level, increased winter rainfall, increased occurrence of storms and flooding and the changes in agriculture and habitat likely to result from increased temperatures. There will be a wide range of economic consequences, including increased insurance costs, expenditures on flood and storm defences, increased water management costs as well as changes in agricultural output.

1.10 Sir John pointed to three principles on which current international action was based:

- the precautionary principle (lack of scientific certainty should not prevent action);
- the polluter pays; and
- the principle of equity, both intergenerational (recognising needs of future generations) and international (dividing permitted global emissions on a population basis) .

1.11 He said that emissions of carbon dioxide could be reduced, and their effects mitigated, mainly in three ways by:

- improvements in the efficiency of energy generation and energy use;
- changes to non-fossil-fuel sources of energy generation; and
- sequestration of greenhouse gases.

1.12 In addition to these actions to reduce emissions it would be necessary to take steps to adapt to climate change, including improved flood defences, changes to water management and agriculture. Both mitigation and adaptation are essential and are not alternatives.

1.13 Sir John concluded by noting that the technology was available to stabilise carbon dioxide emissions at about 550ppm and that the cost of doing this was relatively modest at around 1% of GDP spread over the next 50 years. What was needed was the will to act.

## *UK action*

1.14 Adopting a similar analysis the Royal Commission on Environmental Pollution proposed a 60% reduction in carbon dioxide emissions for the UK by 2050. Part of the UK Government's response to this Report indicated that meeting such a target was feasible but would not be easy. It noted also that at about 0.02% of GDP the costs of reducing carbon emissions was relatively small.

1.15 There is broad agreement between all authorities that the most effective and efficient way to achieve this would be through a system of 'Carbon Trading' supported by regulations and pricing of carbon emissions. Trading allows those who can reduce emissions at least cost, to sell some of their contribution to lower emission levels to those who find it more expensive to reduce emissions. Such schemes provide economic rewards to firms and countries who take a lead in carbon abatement

1.16 In addition to the Kyoto carbon abatement targets the UK has targets to obtain 10% of its electricity supplies from renewable sources and to have 10GW of Combined Heat and Power (CHP) capacity installed by 2010. The European Union has recently announced a target to obtain 28% of electricity from renewable sources by 2010. The EU has also introduced a range of minimum standards for energy-using appliances, including motor vehicles, through a combination of mandatory and voluntary agreements.

## *PIU study*

1.17 Last year the UK Government announced a thorough review of UK Energy Policy to be undertaken by the Performance and Innovation Unit (PIU) in the Cabinet Office. The stimulus for this review was the change in context for UK energy policy. Trends in energy markets have been comparatively benign over the past 10-15 years. The UK has been self-sufficient in energy; commercial decisions have resulted in changes in the fuel mix that have reduced UK emissions of greenhouse gases and trends in world markets and domestic liberalisation have reduced most fuel prices. The future context for energy policy is expected to be different. The UK will be increasingly dependent on imported oil and gas. The Californian crisis has highlighted the importance of putting in place the right incentives for investment in energy infrastructure.

1.18 It is generally agreed that energy policy should address all three objectives of sustainable development—economic, environmental and social—as well as energy security. The overall aim should be the pursuit of secure and competitively priced means of meeting the UK's energy needs within and an environmentally sustainable energy system. However since climate change objectives must largely be achieved through the energy system, where energy policy decisions involve trade-offs between environmental and other objectives, then environmental objectives should take preference. There is a strong likelihood that the UK will

need to make very large carbon emission reductions over the next century in order to comply with international agreements. The immediate priorities of energy policy are likely to be most cost-effectively served by promoting energy efficiency and expanding the role of renewables.

1.19 The conclusion from the PIU report suggests that to meet possible carbon reduction targets by 2050 it will be necessary to have:

- a reduction of at least 50% in total energy demand through energy efficiency measures;
- at least 50% of total electricity production produced from zero-carbon sources;
- substantial changes in vehicle technology to ones that provide very low carbon emissions.

1.20 In support of these broad conclusions the report recommends:

- a step change in energy and vehicle efficiencies. In the domestic sector an improvement by 20% by 2010 is proposed, with a further 20% improvement by 2020;
- increasing the target for the electricity generation from renewable sources to 20% by 2020;
- addressing urgently the barriers to renewable and CHP investments.

## 2. THE WELSH CONTEXT

2.1 Wales has to see its energy needs, how it meets them, and its contribution to reducing carbon emissions and global warming, in the context of developments elsewhere within the United Kingdom and the rest of the world.

2.2 Wales has a proportionally larger industrial base than the rest of the UK including coal mining, oil refining and electricity generation. The gas and electricity systems in Wales are integrated with those of England and Scotland through the National Grid and National Transmission System (NTS). The table below shows Wales has proportionally more power generation capacity, and slightly less renewables capacity, than the UK overall.

|                              | Wales | UK Total | Wales as proportion of UK (%) |
|------------------------------|-------|----------|-------------------------------|
| <b>Population</b> (millions) | 3.0   | 60.0     | 5.0                           |
| <b>Power generation</b>      |       |          |                               |

|                            |      |      |     |
|----------------------------|------|------|-----|
| Total capacity (GW)        | 5.5  | 72   | 7.6 |
| Electricity produced (TWh) | 33.5 | 381  | 7.9 |
| Nuclear capacity (GW)      | 1.0  | 13.0 | 7.7 |
| Renewables capacity (GW)   | 0.23 | 5.3  | 4.3 |

2.3 The demand for heat in Wales is higher than the UK average due to our larger industrial base, for example 42% of gas supplied in Wales is to industry compared to 27% in the UK. An additional factor is the age of the housing stock with more than 40% of houses in Wales having solid walls compared to an average of 27% in the UK. Heat demand is not increasing as fast as electricity demand and there tends to be more scope for reducing heat demand than electricity demand through energy efficiency measures. This coupled with the greater carbon intensity of electricity, compared with other fuels, means that the main focus on reducing carbon emissions is in respect of electricity production.

2.4 The situation is exacerbated by the expectation that the UK nuclear power stations, including Wylfa in Wales, are expected to be decommissioned over the next 20 - 25 years, thereby removing a significant source of zero-carbon electricity. Indeed over the next 20 years 38GW of generating capacity, almost half of all the power stations in England and in Wales, are expected to be retired and will need to be replaced in some fashion. Given the imperative to reduce carbon emissions there is a strong incentive to ensure as large a contribution as possible from renewables.

2.5 Apart from the need to identify new sources of energy, the decommissioning of existing power stations will have wider economic consequences in the longer term as these older technologies decline and the jobs and skills that go with them need to be redeployed.

2.6 The table below shows the contributions that renewables make to electricity production in a range of EU countries in 1997 and the projected levels for 2010. The table shows the figures with and without hydroelectricity (since hydro resources are not uniformly distributed this facilitates international comparisons). The 2010 projections also show the total electricity produced (in TWh). It can be seen that some countries are forecasting significant growth in renewable energy between 2010 and 2025. For example the German programme includes a 25% contribution to electricity production from wind by 2025, 15% (20-25GW) from off-shore and the balance from on-shore. The Welsh figures for 2010 are based on the 4TWh target proposed later in this report.

## Electricity generated from renewable sources

|             | Excluding Hydro |      | Including Hydro |       |       |
|-------------|-----------------|------|-----------------|-------|-------|
|             | 1997            | 2010 | 1997            | 2010  | 2010  |
|             | %               | %    | %               | %     | TWh   |
| Wales       | 0.8             | 10.0 | 1.5             | 10.7* | 4.0   |
| UK          | 0.9             | 9.3  | 1.7             | 10.0  | 50    |
| Denmark     | 8.7             | 29.0 | 8.7             | 29.0  | 12.9  |
| Germany     | 2.4             | 10.3 | 4.5             | 12.5  | 76.4  |
| France      | 2.2             | 8.9  | 15.0            | 21.0  | 112.9 |
| Sweden      | 5.1             | 15.7 | 49.1            | 60.0  | 97.5  |
| Netherlands | 3.5             | 12.0 | 3.5             | 12.0  | 15.9  |
| EU total    | 3.2             | 12.5 | 13.9            | 22.1  | 674.9 |

*Percentages are of total production in each country. The Wales figures for 2010 assume current production (33.5TWh) remains and is enhanced by an additional 4.0TWh of renewable energy giving a total of 37.5TWh.*

2.7 The National Assembly has a duty under Section 121 of the Government of Wales Act to promote sustainable development. It is therefore committed to the development of policies and actions across the Assembly that take environmental, economic and social objectives and implications properly into account. Where possible, policies are developed which deliver effective protection of the Welsh environment and contribute to tackling global and environmental threats such as climate change. In the context of energy use, 70% of the Assembly's own electricity purchases already come from renewable sources – against an overall UK government target of 5% by 2003 and 10% by 2008.

2.8 All the studies carried out by IPCC, RCEP, PIU and others have concluded that it is necessary to stabilise carbon dioxide concentrations whilst maintaining economic growth. To do this it will be essential to reduce energy demand by improvements in energy efficiency and to reduce the carbon intensity of the fuels used - especially electricity. There is broad agreement that within liberalised electricity markets the most promising route for achieving these reductions is through the development of renewable energy.

2.9 It is important not to look at these issues in isolation or to see them all in a negative way. Hand in hand with the need to change the way in which energy is used and generated, there are opportunities for Wales to embrace the new technologies that are being developed.

Renewable energy is an industrial sector which can be expected to expand rapidly over the next 20 years as fossil fuels are replaced by alternative technologies. It presents opportunities for Welsh companies to become involved in the development of new technologies and to generate exports to rapidly growing world markets.

2.10 These in turn will lead to the creation of significant numbers of skilled and well-paid jobs. In Denmark, for example, the renewable sector already employs 15,000 people at home and a further 15,000 abroad and these numbers are increasing rapidly.

2.11 Wales is an ideal location for the development of renewable technologies, especially wind, tide and sea-current, and our traditions in heavy manufacturing and civil engineering can provide the right background for investment in these sectors.

2.12 Wind-power and biomass are both ideally suited for rural areas and offer opportunities for investment and job creation at a time when diversification is urgently needed.

2.13 In the longer term industry and business throughout Wales will benefit from a reliable supply of electricity from renewable sources at a competitive price in a world regime that will increasingly penalise polluting technology.

2.14 The challenge is to harness these strengths and to identify markets in which we can challenge - particularly niche markets where we are not in direct competition with businesses which are established already.

2.15 In the light of all this evidence the Economic Development Committee has concluded that its Energy Review should focus on energy efficiency, renewables, combined-heat and power and economic drivers of energy production and use. This the first report of the Review focuses on renewables, which was selected as the first topic due to the perceived urgency associated with planning issues and facilitating an early start to an enhanced renewables program.

### **3. RENEWABLE ENERGY IN WALES**

#### **Resource potential, costs and risks**

##### **Potential**

3.1 A strategic study of the renewables potential in Wales, covering technical, economic and planning issues, has been undertaken and a draft report is available. This concluded that renewable energy created a win-win situation by

- creating high quality sustainable employment;
- contributing positively to carbon abatement thereby helping to fulfil commitments;

- facilitating diversification and sustainability in the rural economy;
- helping local communities have secure, cost effective energy supplies.

3.2 The report emphasised the opportunity for expanding renewables production in Wales and estimated the long term potential, taking account of technical, economic and environmental constraints, at almost 12 TWh of electricity plus 5 TWh of heat. This represents more than a 30-fold increase in output compared with today's levels. Furthermore over the next 20-50 years there will be substantial changes in technology, costs and environmental factors that are likely to increase the potential. The table below sets out the current UK use of heat and electricity together with forecasts based upon varying degrees of energy efficiency improvements. This shows that the report identifies Welsh renewables as having the potential to supply 7.5% of UK electricity needs and a small contribution to heating demands.

### UK energy projections (TWh/annum)

|                        | 2000 | 2050 (projections) |
|------------------------|------|--------------------|
| Heat demand            | 950  | 530-850            |
| Electricity production | 380  | 300-475            |

### Costs

3.3 One of the significant advantages of most renewable technologies is that they are relatively small scale and modular. This has several benefits for energy systems.

- short lead times for increasing supply;
- lower impact of failure of individual units;
- lower risks for investors;
- opportunity for significant "learning by doing" to reduce costs.

3.4 "Learning by doing" refers to the observed relationship between reduction in production costs with cumulative production, a well-documented relationship across a wide range of mechanical, chemical and material industries world wide.

3.5 Data for EU wind projects demonstrates that the cost of wind power has fallen by 18% with each doubling of cumulative production. Assuming this trend continues, the PIU study estimated that by about 2020 wind energy would be the cheapest form of electricity production at less than 2p/kWh.

3.6 As well as having different production costs and resource potentials, renewable technologies also have different characteristics. Hydro, energy crops, landfill gas and energy from waste provide the most reliable sources of power because the source can be stored -

essentially the same as fossil fuel plants. All the other sources are intermittent with tidal being the most predictable and solar the least predictable.

3.7 So long as renewables contribute less than 10% of total electricity production their intermittency need not pose a problem. The electricity supply system already has to have a 'spinning' reserve of about 20% to provide an instantaneous response to fluctuations in demand or the possible failure of a large power station. If intermittent sources of electricity were to contribute as much as 20% of total power generation then the amount of reserve would need to be increased, but with only a small cost penalty. In the future a mix of renewable sources coupled with new electricity storage systems, possibly based on regenerative fuel cells, would enable renewables to make a contribution in excess of 20%.

3.8 The table below shows the current and projected costs for different electricity production technologies. It also indicates the comparative size of the resource base of each and the differences in their availability. These suggest that to provide the most secure addition to electricity production, at least cost, a mix of renewable sources is needed.

### Cost of generating electricity and resource potentials

| Type of technology   | Current cost range<br>(p/kWh) | Costs expected 2020<br>(p/kWh) | Additional potential | Availability |
|----------------------|-------------------------------|--------------------------------|----------------------|--------------|
| Fossil-fuel plant    | 2.0 - 2.5                     | 3.0 – 3.5*                     |                      |              |
| Large hydro (> 10MW) | 2.5 - 3.0                     | 2.5 – 3.0                      | None                 |              |
| Small hydro (10MW<)  | 4.0                           | 3.5 - 4.0                      | Small                | High         |
| Energy from waste    | 2.5 - 3.0                     | 2.5 – 3.0                      | Small                | High         |
| Landfill gas         | 2.5 – 3.0                     | 2.5 – 3.0                      | Very small           | High         |
| On-shore wind        | 3.0 –3.5                      | 1.0 – 2.0                      | Large                | Intermittent |
| Off shore wind       | 5.5- 6.0                      | 2.0 – 4.0                      | Very large           | Intermittent |
| Near shore wave      | 6.0                           | 3.0 – 4.0                      | Moderate             | Intermittent |
| Off shore wave       | 8.0 – 10.0                    | 4.0 – 6.0                      | Very large           | Intermittent |
| Tidal flow           | 3.5 – 6.0                     | 2.5 – 4.0                      | Moderate             | Predictable  |
| Energy crops         | 6.0 –8.5                      | 4.5 – 6.0                      | Large                | High         |

|                    |         |      |       |              |
|--------------------|---------|------|-------|--------------|
| Solar photovoltaic | 40 – 60 | 10.0 | Large | Intermittent |
|--------------------|---------|------|-------|--------------|

*\* includes 1p/kWh for carbon-dioxide sequestration as required for low carbon future.*

3.9 The above table does not include the Severn barrage. The feasibility of a barrage scheme has been studied intensively and a report on the need for further updating is currently being considered by DTI. Any decision would need to consider the balance of environmental effects with and without the barrage, as well as costs.

## **Development Risks**

3.10 The major obstacles to the development of renewables are planning consents, issues associated with grid connection, wholesale electricity prices and obtaining development finance at low enough costs.

## ***Planning***

3.11 Energy supply, climate change, employment, environmental protection and commercial development are all important. Change is occurring, both on the ground and in people's perceptions, and more change is inevitable. What some groups and individuals see as opportunities, other see as threats and there is a need to bring together the many different and valid perspectives on the issues involved. The planning system is the right forum to do this locally but the debate needs to be within the correct context and with a full understanding of the social, economic and environmental issues. Many important and critical decisions will need to be taken and it is important to have frameworks in which these can be done quickly and efficiently and in a way which achieves as wide a degree of acceptance as possible in the decisions.

3.12 The Welsh Assembly Government has recently published its proposals for improving certainty and confidence in the planning system in its consultation paper "Planning: Delivering for Wales". The objectives of this paper, particularly improving the quality and speed of outcomes, are key to finding our way towards an integrated solution to renewable energy.

3.13 Updated planning policy guidance on renewables is due to be issued in Planning Policy Wales (PPW) in March 2002. The Technical Advisory Group, which is assisting in the review of TAN 8, is working towards achieving consensus on the technical guidance needed to support that policy. Officials consider that there are encouraging signs that the industry and other stakeholders see the potential of an analytical tool, being developed as part of a CCW research project, designed to help local authorities identify the key impacts of proposals. It is hoped that the tool will be developed so that it can underpin future policy at both local and

national levels

### ***Electricity Connection and Prices***

3.14 It is widely recognised that renewables generators suffer two disadvantages due to the way that the electricity system in the UK grew up and has developed since liberalisation. The present system was designed around remote large-scale power stations supplying electricity to consumers through the national grid and local distribution networks. It is difficult and currently expensive to connect a small-scale generator within the distribution system - so called 'embedded generation'. There is an Embedded Generation Working Group in the DTI charged with resolving these issues as a matter of urgency.

3.15 The method of buying and selling electricity in the wholesale market (between generators and suppliers) has recently been changed by the introduction of the New Electricity Trading Arrangements (NETA). This has succeeded in reducing the wholesale price of electricity, but at the cost of imposing excessive penalties on intermittent generators (renewables and CHP). This is also an area under investigation by Ofgem and DTI.

### ***Financing***

3.16 The development of new and novel technologies invariably encounters difficulties in attracting finance and there is an important role for the public sector in facilitating demonstration projects for the various technologies. This should go some way to reducing the risk involved in deploying expensive technology. Matters have been compounded with falling prices for energy. High-risk investments with equity participation demand high returns for investors who require due diligence studies, firm costings and a degree of certainty on key factors such as planning. Any delays increase risk and can deter the most committed of investors.

3.17 Public sector involvement at the stage of proving technology can help alleviate some of these risk factors. This can be complemented by more imaginative procurement within the public sector to generate demand and to foster local sourcing and an indigenous base for the technology. There is clearly a need for an imaginative input from government at local, Welsh and UK levels to help share the risks and rewards, and thereby facilitate private sector investment.

## **4. RENEWABLES POLICY ISSUES**

4.1 There is a very strong scientific consensus that global warming is occurring and is largely due to the release of carbon dioxide resulting from the use of fossil fuels. The Committee accepts the broad consensus that in order to reduce carbon emissions to stabilise carbon dioxide concentrations it will be essential to pursue *both* energy efficiency and renewable

energy sources with far greater vigour over the coming decades.

## **Recommendation 1**

### **4.2 We recommend that the National Assembly for Wales:**

**(a) recognises that over the next twenty to fifty years it will be necessary to move towards a zero carbon electricity system;**

**(b) seeks to develop its indigenous renewable resources so as to make a timely contribution to the reduction of carbon emissions;**

**(c) promotes renewable sources of energy in such a way as to enhance industrial, rural and commercial opportunities in Wales without prejudicing tourism or areas of environmental significance.**

4.3 The UK has a target to supply 10% of electricity from renewables by 2010 rising to 20% by 2020. This is supported by three policy instruments:

- The renewables Obligation placed on all electricity suppliers. This provides a subsidy of up to 3.0p/kWh for renewables
- Renewables exemption from the Climate Change Levy imposed on all businesses. This is worth up to 0.43p/kWh
- Capital grants for renewables through a number of mechanisms, including a recent £100m allocation.

4.4 The Assembly already has a target to generate 10% of electricity from clean sources by 2010. A target specified as a proportion of production in Wales is ambiguous due to the effect on the figures of the possible closure, or construction, of a large power plant in Wales. To avoid this it is preferable to specify a target in terms of annual production (TWh).

4.5 Various targets have been proposed ranging from 1.7 TWh to 4.5 TWh by 2010, compared to current renewables production of 0.6TWh. There is a consensus that a target between 3.5TWh and 4.0 TWh would be very demanding, but achievable. Biomass, waste and landfill gas can all be used to generate both heat and electricity, and this should be achieved using CHP technology wherever possible. The proposed heat target assumes this is achieved in half of all cases.

## **Recommendation 2**

**4.6 We recommend that the National Assembly adopts Welsh targets for both electricity production and heat production from renewable sources. The electricity production targets should be 4 TWh by 2010 rising to 8TWh by 2020. The heat targets should be 1.5 TWh by 2010 and 3 TWh by 2020.**

**4.7 In order to promote these targets the National Assembly should seek information from all local authorities on the contributions that they consider could be made to meeting such targets from within their areas.**

4.8 The UK target and the Renewables Obligation are deliberately framed in terms of an overall contribution from renewables and do not differentiate between different renewable technologies. This has been criticised as favouring those currently most developed and disadvantaging those where significantly more work is needed (e.g. tidal stream and wave power). Conversely, it has the advantage of avoiding the difficulties and traps associated with 'picking winners'.

### **Recommendation 3**

**4.9 We recommend that the National Assembly continues to develop its own use of renewable energy with the aim of becoming a 100% user of renewable energy and urges other agencies and public bodies in Wales to foster the development of renewable energy by:**

**(a) switching to green electricity for their own use;**

**(b) supporting development projects for technologies that exploit local opportunities or unique resources.**

4.10 The obstacles to embedded generation, connection charges and NETA have already been clearly identified (by the industry and in the PIU working papers) and recognised (by both DTI and Ofgem) as requiring urgent attention and there are various committees and working parties addressing these issues.

### **Recommendation 4**

**4.11 The National Assembly should add its weight to the pressure to resolve these obstacles as a matter of urgency. It should also request clarification from the local Distribution Network Companies on their policies for connections for renewable**

**generators.**

4.12 The main obstacle, particularly for on-shore wind development, has been obtaining planning permission. There is an inevitable difficulty associated with balancing local, national and global environmental concerns and these are focussed in planning applications. Even if a mechanism could be found for facilitating such conflicts there remains the issue of delay, calling in of applications and ultimate responsibility for approval of different sized power generating facilities. On-shore wind has given rise to acrimonious differences between planners and developers as well as between different sections of the public.

4.13 The problems are exacerbated by the need for decisions on the largest projects to be taken outside Wales. These inevitably are the more significant projects and, regardless of the thoroughness with which the analyses are undertaken, unwelcome decisions will be hardest to accept locally when they are taken outside the democratic control of the National Assembly.

4.14 Experience with planning issues in Northern European has been very different and this is largely because municipal authorities have carried out many of the developments themselves. This has meant that local residents received a direct benefit from the development as well as contributing to national and international goals. To date there has been very little, if any, community led development of renewables in the UK. Nor has there been any direct benefit to the local communities where developments occur or are planned. This contrasts with, for example, the way that builders, supermarkets and other site developers will often include a local amenity in their development plan to provide local residents with a direct benefit.

## **Recommendation 5**

**4.15 The National Assembly should;**

**(a) as a matter of urgency, seek ways to clarify and streamline the planning process for renewable energy developments;**

**(b) seek an extension of its powers with regard to the approval of power generation facilities;**

**(c) find mechanisms whereby renewables developments can provide immediate and tangible benefits to the local communities in which they are located.**

4.16 The Committee notes the First Minister's commitment in 'A Winning Wales' to the development of clean energy technologies and for Wales to be a showcase of sustainable economic development. The issues addressed in the Committee's report clearly fall fully within his stated aims to increase research and development and innovation, and to build on Wales' considerable strengths in manufacturing.

## **Recommendation 6**

**4.17 We recommend that the Minister for Economic Development identifies the energy sector as a priority sector for development in Wales and ensures there are programmes in place to encourage the development of skills in all parts of the country to meet these needs, and to encourage private sector investment in this vital sector.**

## **5. Conclusion**

5.1 There are many different perspectives, including fears and opportunities, on the changes to the energy system that are already taking place and which will be accelerated over the next few decades. These changes will inevitably lead to both gains and losses for communities and institutions. Facilitating such change will be easier if it is fostered and supported by an inspiring vision of the future, a vision that encourages everyone to celebrate the opportunities and gains as well as bearing whatever costs are involved.

5.2 Alongside these direct energy issues there is a wealth of economic opportunities for Wales to embrace. New technologies provide major opportunities for research, development, investment, new skills and jobs. These will build on many of Wales' traditional strengths and provide opportunities for all parts of the country – including rural areas where the need for diversification is so urgent.

**5.3 The National Assembly should seek to promote a vision for renewable energy in Wales that emphasises safe, clean and secure energy supplies and contributes positively to reducing global warming. It should emphasise that this will provide opportunities for industrial and rural development, long-term employment and increased prosperity. Most of all it should promote this vision by example and by vigorously pursuing well thought out policies.**

## **Annex A - Glossary of Terms for Renewable Energy**

The Glossary is arranged in alphabetical order for quick reference. After each set of initials is an expansion with (where appropriate) an approximate phonetic pronunciation. The explanations given are necessarily brief.

**Climate Change Levy** – This is a levy imposed on all commercial and industrial users of gas and electricity and increases the costs of these fuels. The revenue from the Levy is recycled to business through reductions in National Insurance contributions; thereby reducing the costs of employment. Large users can reduce the Levy by entering into a voluntary agreement to significantly improve their energy efficiency. Fuels derived from renewable sources are exempt from the Levy; this provides a small incentive to renewable generators (0.43p/kWh).

**DNC – Distribution Network Companies** – These are the operators of the local electricity distribution networks. Previously the Regional Electricity Companies (such as Manweb and SWALEC) controlled the networks and sold electricity to customers. Those two functions have now been split (by Ofgem) into sellers and network operators or DNCs.

**Embedded generation** – Most electricity is produced at large power stations remote from areas of demand. Electricity from these power stations is transmitted, via the National Grid, to the local distribution systems. These local distribution systems have been designed to allow the transfer of electricity from the grid to consumers. Electricity generators that are connected to the distribution system (as opposed to connected to the main transmission system) are referred to as embedded or distributed generators. They cause a difficulty because now electricity flows in the distribution network can be in different directions. This requires modification to switch gear and control systems. Many renewables and CHP plants are embedded generators.

**GWh – Giga-watt hour.** A GWh is a measure of energy. One GWh equals a million kWh (kilo-watt-hours) or  $10^9$  Wh. A 1MW device operating continuously for a year will produce 8.76 GWh of electricity.

**IPCC – International Panel on Climate Change.** An intergovernmental body established by the United Nations to collect and disseminate information on climate change.

**NETA – New electricity trading arrangements** (pronounced knee-ta). The new trading system is based on long term contracts between generators (producers of electricity) and suppliers (companies that sell to consumers). If either party to the contract is "out-of-balance" then they have to pay penalty fees. Thus if a generator produces less than contracted or a supplier sells more than contracted then they have to pay for the difference at a rate determined by the operator of the system (National Grid plc). To date the out of balance charges have been extremely high (twice the contract price). This unduly penalises intermittent

generators since they cannot guarantee a level of supply. As a result CHP generators and renewable generators have been severely disadvantaged. Ofgem have recognised this and there is a working party looking at how to resolve the issue.

**NFFO – Non-fossil fuel obligation** (pronounced noff-oh) This was a scheme introduced to prepare nuclear power for privatisation. In the 1990s renewables were included under NFFO which provided a level of support for renewable generators through competitive contracts. There were five rounds of bidding (referred to as NFFO-3 etc) and approval was given to 933 projects with a combined capacity of 3639MW. However only a fraction of these have been actualised, only 47% of the contracts in England and Wales received planning permission. The contract prices for most renewables reduced significantly over the five rounds of bidding; for example wind power costs fell from 7p/kWh to about 2.5p/kWh.

**NTS – National Transmission System** This is the name of the high capacity gas pipelines that are used to move gas around the UK in bulk. It is the equivalent of the National Grid in the electricity system.

**Ofgem – Office for regulating gas and electricity markets.** Ofgem is responsible for the economic regulation of all aspects of the gas and electricity markets. This includes establishing markets, setting performance targets, determining the return on investments and contracting arrangements. It was Ofgem that devised NETA.

**PIU – Performance and Innovation unit.** A unit established within the Cabinet Office to carry out studies on issues that cut across traditional departmental boundaries.

**RCEP – Royal Commission on Environmental Pollution.** It produced an important document, "Energy – the changing climate", that called for 60% reductions in CO<sub>2</sub> emissions by about 2050 in the UK.

**RO – Renewables Obligation.** This is the replacement for NFFO for supporting renewable electricity production. The RO places an obligation on all suppliers to obtain a proportion of their electricity from renewable generators. The proportion will be about 3% in 2002 rising to 8% in 2010. A supplier can either buy electricity from a renewable generator and hence receive the necessary certificates (ROCs – see below), or can purchase ROCs from other suppliers or can pay Ofgem 3p/kWh for the unmet obligation. This effectively gives renewable generators a 3p/kWh premium over other sources of electricity. When combined with the Climate

Change Levy (CCL) exemption the price suppliers might be willing to pay for renewables is 2.0p/kWh (wholesale price) + 3p/kWh (RO) + 0.43p/kWh (CCL exemption) = 5.43 p/kWh. At this price many renewables are economic. However not all these benefits will accrue to the renewable generator (the supplier will take some) and the current impact of NETA significantly reduces the value of intermittent electricity.

**ROC – Renewables Obligation certificate** – (pronounced rock). These certificates are the means by which a supplier demonstrates compliance with the Renewables Obligation to Ofgem. The certificates are tradable, which means that some suppliers might accrue more than they need and sell them to other suppliers who have insufficient. The buy-out price for the obligation is 3p/kWh, so certificates are likely to have a value close to this.

**TWh – Tera-watt-hours.** A tera-watt-hour is a unit of energy. One TWh equals a thousand GWh (see above), a billion kWh (kilo-watt-hours) or  $10^{12}$  Wh (watt hours). The UK as a whole consumes about 200 TWh of electrical energy per year.

## **Annex B – Terms of Reference**

### **NATIONAL ASSEMBLY FOR WALES - ECONOMIC DEVELOPMENT COMMITTEE**

#### **Energy Policy Review: Terms of Reference**

##### **Review Objectives**

1. To explore possible long term scenarios for (non-transport) energy production and use in Wales and make recommendations to the Assembly Cabinet on a strategic framework most appropriate to achieving the optimum use and generation of energy in Wales by 2020 and with regard to further developments.

##### **Proposed Process**

2. Officials will open the process by offering a possible outline vision of energy in Wales in 2010 and beyond. The Committee will then call a wide range of expert witnesses to respond to this and to gather views on the range of potential energy scenarios Wales might face by 2020. The Assembly's responsibility to promote sustainable development, whilst facilitating economic growth and development will underpin all the work of the Review.

## Key Questions

3. The Review will examine issues such as:

- a. The energy opportunities and needs of Wales in the future bearing in mind Wales' current distribution of energy sources and associated infrastructures;
- b. The desirability of self sufficiency in energy production with greater emphasis on small, local generating units. How much electricity production should move from being dependent on large grid-linked power plants to distributed, especially combined heat and power, systems at the domestic, company, and business park/public buildings levels;
- c. The potential to increase energy production from renewable sources;
- d. The potential to develop strong renewable energy service and manufacturing sectors and associated research and development activities;
- e. The economic potential of underground (onshore and offshore) fuel reserves in Wales and the environmental impact of exploiting them;
- f. Whether, recognising the designation of the Severn Estuary as a Special Area of Conservation, Wales should be pursuing the development of the 8GW Severn Barrage project;
- g. The current and future potential contribution of nuclear power;
- h. The kind of energy, especially gas and electricity infrastructures, (including storage systems) needed in the future in Wales;
- i. How electricity demand patterns will change with changing demographics, industrial and business patterns, transport fuels and greater dependence on ICT systems;
- j. Measures to reduce the overall consumption of energy and minimise fuel poverty in Wales;
- k. The implications for the planning system to enable the desired outcomes
  1. The implications of the recommendations for structural fund programmes, development and other business support agencies, for central Government Departments and regulators and for the Assembly;
- m. The further powers which might need to be devolved from Whitehall Departments to enable the National Assembly to pursue its energy objectives effectively;

4. This represents a substantial amount of work and Members will need to consider the coverage of the study in the context of the time available. It is anticipated that the study will take at least one year. It may be feasible to undertake the work in stages and submit interim reports.

5. Some of these issues will need to be explored jointly with other Assembly Committees, in particular the Environment and Transport Committee and the possibility of one or more consultation exercises might need consideration.

## **Method of Working**

6. The Committee agreed to establish a Reference Group to oversee the Review and the preparation of its final report. In conjunction with the Clerks, the Group will:

- a. draw up a detailed work programme, targets and time frame for the Review;
- b. consider the expert advice needed for the study;
- c. in conjunction with the adviser(s), consider the individuals, companies and organisations which should be invited to give evidence to the Committee and the way in which this should be approached.
- d. consider the liaison arrangements with other Committees and officials within the National Assembly
- e. consider a programme of visits to provide members with an initial overview of the main issues.

## **Membership Of Reference Group**

7. EDC agreed that a Reference Group should be established to facilitate the process of carrying out the Review but stressed that responsibility for the Review would remain with the Committee as a whole and that the Committee would not be bound by decisions taken by the Reference Group.

8. It was agreed that should comprise the Chair, the Economic Development Minister and representatives of the Plaid Cymru and Conservative party groups.

9. The Group would be assisted by Dr Ron Loveland – ISG Division, NafW and invitations extended to representatives from

the Welsh Development Agency;  
Carbon Trust Wales;  
the Environment Agency;  
the Countryside Council for Wales  
the Energy Saving Trust.  
Friends of the Earth Cymru

## **Annex C - Papers considered by the Committee**

**17 October 2001**

EDC 12-02(p4) [EDC Energy Review: 'Energy in Wales' Overview Paper](#)

Innovation and Sustainable Growth Division, National Assembly for Wales

**12 December 2001**

[EDC 17-01\(p4\) Renewable Energy overview](#)

Adam Brown, Future Energy Solutions, AEA Technology

**10 January 2002**

[EDC 01-02\(p2\) Global Warming, Climate Change and Energy Policy.](#)

Sir John Houghton CBE, FRS, Co-chair, Scientific Assessment Working Group,  
Intergovernmental Panel for Climate Change (IPCC).

Sir John Houghton also referred the Committee to the [IPCC report: Climate Change 2001: Synthesis Report 'Summary for Policy makers'](#).

**16 January 2002**

[EDC 02-02\(p1\) Wind Energy - a summary of the issues in planning, policy and targets.](#)

Peter Hinson - EMP Squared Consultants.

[EDC 02-02\(p2\) A brief summary of the Pembrokeshire tidal power project.](#)

Richard Ayre – RG Ayre and Co.  
David Brett – Babbie Group.

[EDC 02-02\(p3\) A vision for Bioenergy in Wales.](#)

Silven Robinson - British Biogen.

[EDC 02-02\(p4\)](#) Renewables Energy in Wales - views of the Countryside Council for Wales.

John Lloyd Jones – Chair, Countryside Council for Wales.

Bryan Riddleston – Council Member, Countryside Council for Wales.

[EDC 02-02\(p5\)](#) A place for small-scale developments in the renewable energy sector?

Andy Bull – Powys County Council.

[EDC 02-02\(p6\)](#) The experiences of Pembrokeshire Coast National Park of renewable energy initiatives and the non- technical barriers to its further development.

David Fletcher – Pembrokeshire Coast National Park.

### **30 January 2002**

[EDC 03-02\(p1\)](#) The Environment Agency's contribution to Energy efficiency.

Alun James – Environment Agency.

[EDC 03-02\(p2\)](#) Household energy efficiency in Wales.

Nick Eyre – Energy Saving Trust.

[EDC 03-02\(p3\)](#) Energy efficiency in the non-domestic sector.

David Vincent – Carbon Trust.

Annie Thompsett – Carbon Trust Wales.

### **13 February 2002**

[EDC 04-02\(p1\)](#) The Severn Barrage Project - a discussion paper

Steve Taylor, Chairman, Management Board - The Severn Tidal Power Group  
Dr. Tom Shaw – Consultant, Shawater Ltd.

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### **Other Papers**

EDC 18-00 (p5) Looking Further Ahead: A Policy for Renewable Energy

Phil Williams, AM.

[EDC 03-02\(p7\)](#) A discussion paper on energy policy in the Wales following a review of relevant energy literature.

Nick Syred, Cardiff University (paper provided via ISG Division, National Assembly)

Strategic Study of Renewable Energy Resources in Wales. Draft Report 19 January 2001.  
Sustainable Energy Ltd.

### **Annex D – Visits made by the Committee**

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#### **First Hydro Ltd, Dinorwig**

Nigel Petrie, Director of First Hydro Renewables.  
Mike Hickey, Station Manager, Dinorwig.

Steve Salt , West Coast Energy.

#### **BNFL - Magnox Electric, Wylfa**

Andy Corrigan, Station Manager.

John Idris Jones, Maintenance Manager.

Roy White Engineering Manager.

John Collingson, designate Engineering Manager.

Paul Giles, HR Manager.

Nigel Beesley, Business Support and Finance Manager.

Mair Owen, Information Officer.

Peter Farrell, Health Physics and Environment.

Beverley Evans, PR and Visitor Centre Manager.

Bill Collard, Trade Unions.

O T Williams. Trade Union.

Iolo Roberts, Trade Union.

### **Powergen, Connah's Quay**

Ray Smith, Station Manager, Plant Manager.

Chris Hammond, Head of Production.

Steve Pace, Head of Engineering.

Martin Sheldon, Head of Production.

John Watts, General Manager of Powergen Gas.

Brian Seabourne, Powergen Regulatory Strategy Manager.

## **BP Energy park, Baglan**

Simon Bowen – Works General Manager, BP Baglan Bay.

Ken Sawyers – Chief Executive, Neath Port Talbot Borough Council.

Bill Cooney – Managing Director, GE Power Systems, Baglan Generating Ltd.

## **National Wind Power, Carno**

### **Annex E - Membership of Reference Group**

Chris Gwyther, AM

Mike German, AM

Phil Williams, AM

Alun Cairns, AM

Ron Loveland Innovation and Sustainable Growth Division,

National Assembly for Wales

Gareth Hall Welsh development Agency

Peter Wilkinson Environment Agency Wales

Nick Eyre Energy Saving Trust

David Vincent Carbon Trust Wales

Bryan Riddleston Countryside Council for Wales

Neil Crumpton Friends of the Earth, Cymru